

What is claimed are:

1. A method of using a water-based boron-containing suspension as a source of boron additive in a starch-based adhesive, said water-based boron-containing suspension being substantially free of organic solvent(s), said method comprising introducing said water-based boron-containing suspension into a mixing or reaction zone during the preparation of said starch-based adhesive.
2. The method of claim 1, wherein said water-based boron-containing suspension comprises:
 - a) from about 5 wt% to about 60 wt% of at least one boron compound;
 - b) from about 0.05 wt% to about 10 wt% of at least one suspension aid; and
 - c) from about 30 wt% to about 95 wt% of water.
3. The method of claim 1, wherein said water-based boron-containing suspension comprises:
 - a) from about 5 wt% to about 18 wt% boron;
 - b) from about 0.5 wt% to about 5 wt% clay; and
 - c) from about 0.05 wt% to about 1 wt% polysaccharide.
4. The method of claim 1, wherein said clay is swellable clay.
5. The method of claim 1, wherein said polysaccharide is xanthan gum.
6. The method of claim 1, wherein said water-based boron-containing suspension is free of amine-based solvent(s).
7. The method of claim 1, wherein said suspension has a maximum particle size of no greater than about 50 microns.
8. An aqueous starch-based adhesive, comprising:
 - a) water;
 - b) starch;
 - c) caustic soda; and
 - d) from about 0.05 wt% to about 10 wt% a water-based boron-containing suspension that is substantially free of organic solvent(s).
9. The adhesive of claim 8, wherein said water-based boron-containing suspension comprises:
 - a) from about 8 wt% to about 13 wt% boron;
 - b) from about 0.5 wt% to about 5 wt% clay; and

- c) from about 0.05 wt% to about 1wt% polysaccharide.
10. The adhesive of claim 8, further comprising a waterproofing additive.
11. The adhesive of claim 8, wherein said adhesive exhibits wet pin bond strength of at least about 5 lbf according to TAPPI T-821 test method.
- 5 12. The adhesive of claim 8, wherein said adhesive exhibits wet bond strength characterized by percentage fiber tear of at least about 50% estimated after wet pin bond strength test.
13. The adhesive of claim 8, wherein said adhesive exhibits a dry pin bond strength of at least about 50 lbf according to TAPPI T-821 test method.
- 10 14. The adhesive of claim 8, wherein said waterproofing additive is a waterproofing resin chosen from ketone-formaldehyde, acetone-formaldehyde, urea-formaldehyde, acetone-urea-formaldehyde, acetone-melamine-formaldehyde, resorcinol-formaldehyde, polyphenolic resin, and mixtures thereof.
- 15 15. A method of making starch-based adhesive of claim 8, comprising adding a water-based boron-containing suspension as a source of boron additive into a mixing zone or reaction zone during the preparation of said starch-based adhesive, said water-based boron-containing suspension being substantially free of organic solvent(s).
- 20 16. A method of making a corrugated board, comprising
corrugating a sheet to create a medium bearing fluted tips having a first side and a second side;
applying a starch-based adhesive of claim 8 to the first side of said fluted tips of said medium to create a first adhesive bearing surface; and
25 bringing a first liner substrate in contact with said first adhesive bearing surface.
17. The method of claim 16, wherein said sheet is a laminate composed of at least two sheets bonded with an adhesive.
18. The method of claim 17, wherein said adhesive is the starch-based adhesive of claim 8.
- 30 19. The method of claim 16, further comprising applying an adhesive to the second side of the fluted tips of the medium to create a second adhesive bearing surface; and bringing a second liner substrate in contact with said second adhesive bearing surface.

20. A corrugated board prepared according to the method of claim 16, comprising
- a) a fluted medium bearing fluted tips having a first side and a second side,
 - b) a first liner substrate, and
 - c) a starch-based adhesive of claim 8 sandwiched between the first side of said fluted tips of the medium and said first liner substrate.
21. The corrugated board of claim 20, further comprising a second liner substrate and an adhesive sandwiched between the second side of said fluted tips of the medium and said second liner substrate.
22. A laminate comprising a first substrate having a first surface and a second surface; a second substrate having a first surface and a second surface; and a starch-based adhesive of claim 8 sandwiched between said first surface of said first substrate and said first surface of said second substrate, said laminate being prepared by applying the starch-based adhesive of claim 8 to said first surface of said first substrate to create a first adhesive bearing surface; and having said first surface of said second substrate in contact with said first adhesive bearing surface.
23. The laminate of claim 22, wherein said laminate is a fluted medium bearing plural fluted tips having a first side and a second side, said starch-based adhesive being applied to the first side of the fluted tips to create said first adhesive bearing surface.
24. A method of using a water-based boron-containing suspension as a source of boron additive in a starch-based adhesive, said method comprising introducing said water-based boron-containing suspension into a mixing or reaction zone during the preparation of said starch-based adhesive, said starch-based adhesive exhibiting wet bond strength characterized by percentage fiber tear of at least about 50% estimated after wet pin bond strength test.
25. An article of commerce, comprising a container that contains a water-based boron-containing suspension, said water-based boron-containing suspension being substantially free of organic solvent(s), said container bearing an instruction to use said suspension in a starch-based adhesive.